SR28 A55 Pavement Design

Let 11/2/2017

Thomas S. Adams, PE – District 11 Pavement Engineer

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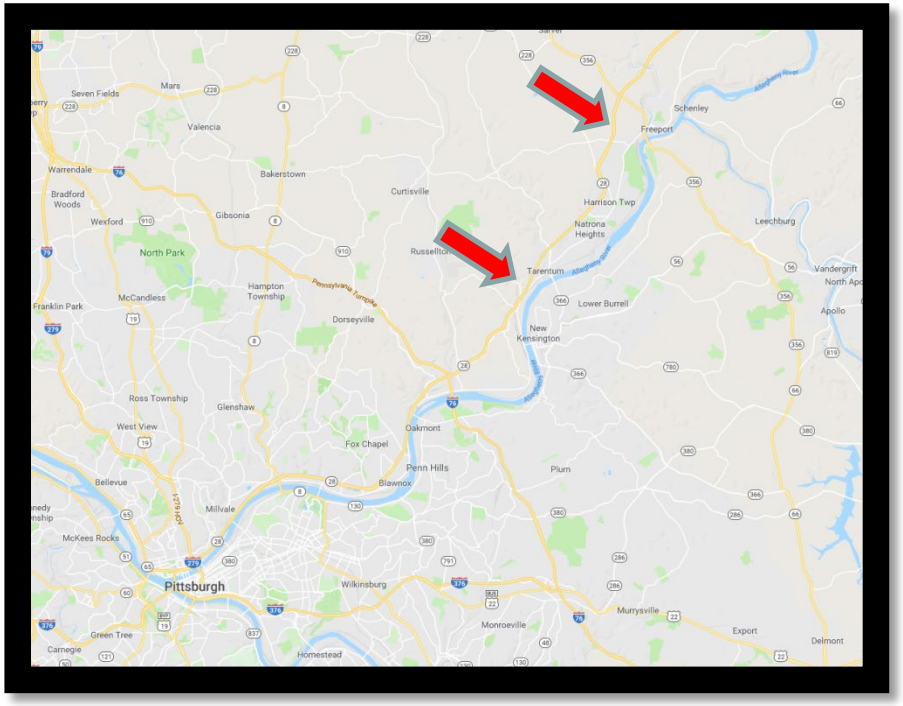
SR28 A55 Pavement Design Solution

- 13.7 Miles of 1984 Reinforced Concrete Pavement
  - 2009 CPR
  - 2004 CPR



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SR28 A55 Pavement Design Solution

- Scope?

Method	Paving Policy Estimate	Engineered Estimate
Patch & Overlay	$30,000,000	$30,000,000
Break & Seat/Rubbilization	$50,000,000	$35,000,000
Unbonded Concrete Overlay	$50,000,000	$40,000,000
Reconstruction	$50,000,000	Same

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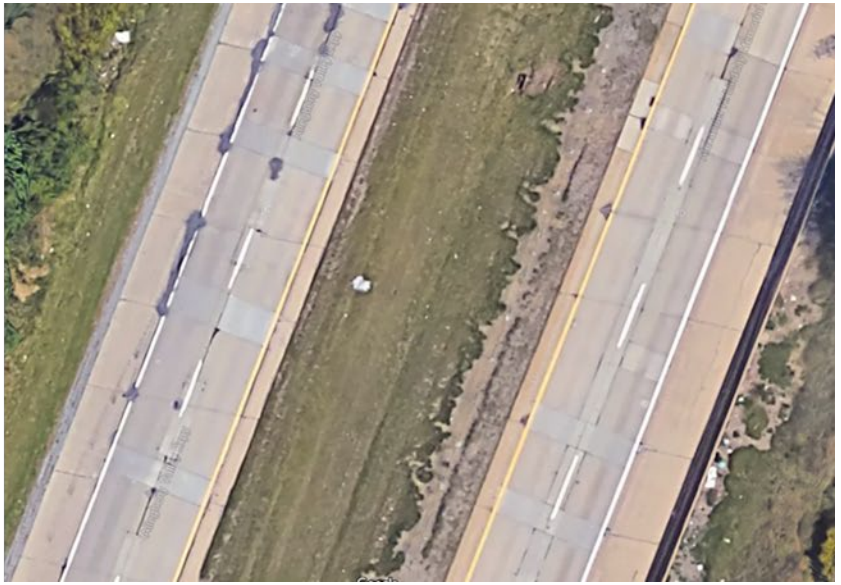
SR28 A55 Pavement Design Solution

- Patch & Overlay
  - Complex joint pattern
    - Difficult to match underlying joints with sawcut.
    - Subsequent projects have increasing likelihood of missed sawcuts.
    - Risks undercuts



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SR28 A55 Pavement Design Solution

- Break & Seat/Rubbilization
  - Resolves complex joint pattern problem.
  - Saves money versus reconstruction.

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SR28 A55 Pavement Design Solution

Rubbilization	Break & Seat
• Recommended for reinforced concrete	• Not recommended for reinforced concrete

• NOT recommended for poor subgrade
• Increased construction variability
  • Fail proof-roll
  • Exposed rebar must be removed
• More expensive ($4/SY)
• Weaker structure
	• Less affected by poor subgrade
	• Less to go wrong during construction
	• Less expensive ($2/SY)
	• Stronger structure

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SR28 A55 Pavement Design Solution

- Pub 242 wants a **16.0” bituminous overlay!**

Existing Materials to be Overlaid:

Cement Concrete (Good condition, < 5% patching)	0.40
Cement Concrete (Fair condition, < 10% patching)	0.30
Cement Concrete (Failed - no patching or > 10% patching)	0.25
Cracked/Break and Seated Cement Concrete	0.25
Bituminous Concrete	0.30

AASHTO 93 suggests layer coefficient between 0.20 to 0.35

Use 0.35

Overlay thickness 16.0” to 13.0”

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- Other help
  - Frost heave
  - Subgrade Resilient Modulus adjustment
    - CBR*1500 instead of CBR*1000
    - Lab testing showed in-situ density similar as that used for CBR test
- 8.5” Bituminous Overlay

Is this going to be OK???

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Fig. 1, D-11 PME

- AASHTO 93’ Method
- Pavement-ME

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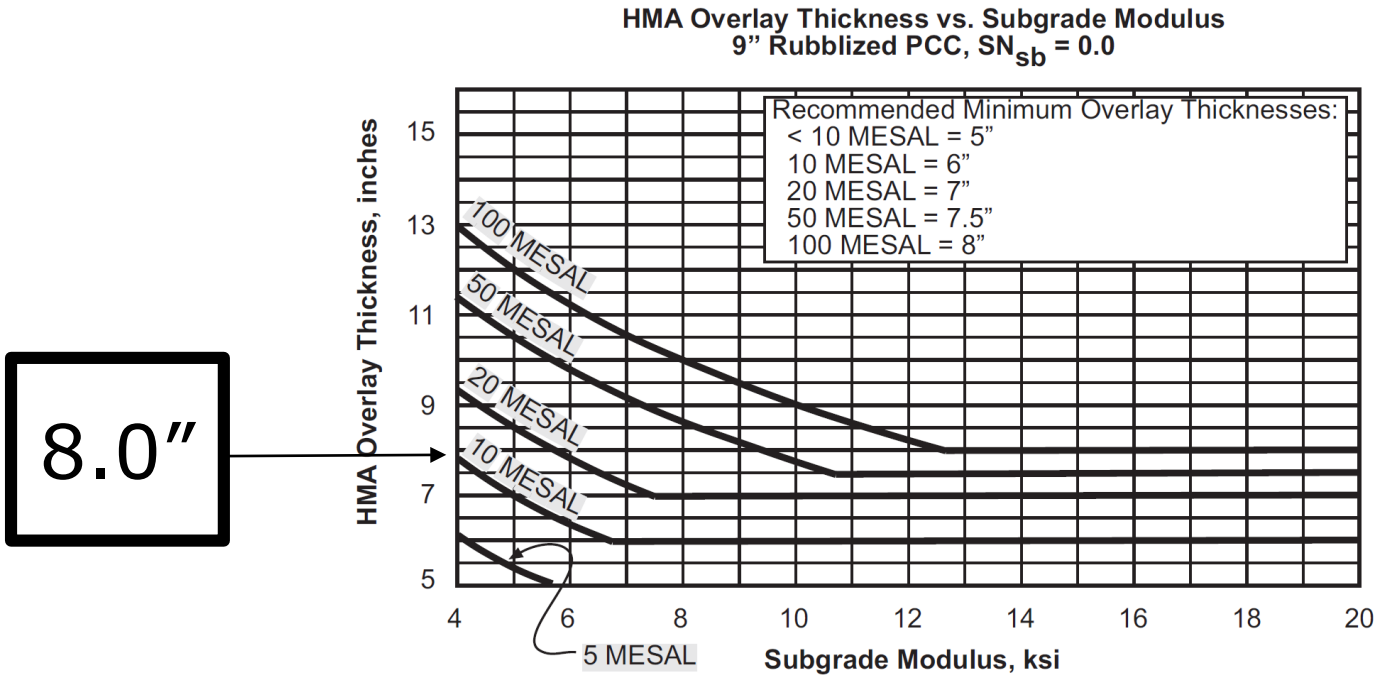
SR28 A55 Pavement Design Solution

- Overlay thickness?
  - NAPA Rubbilization Design Guide



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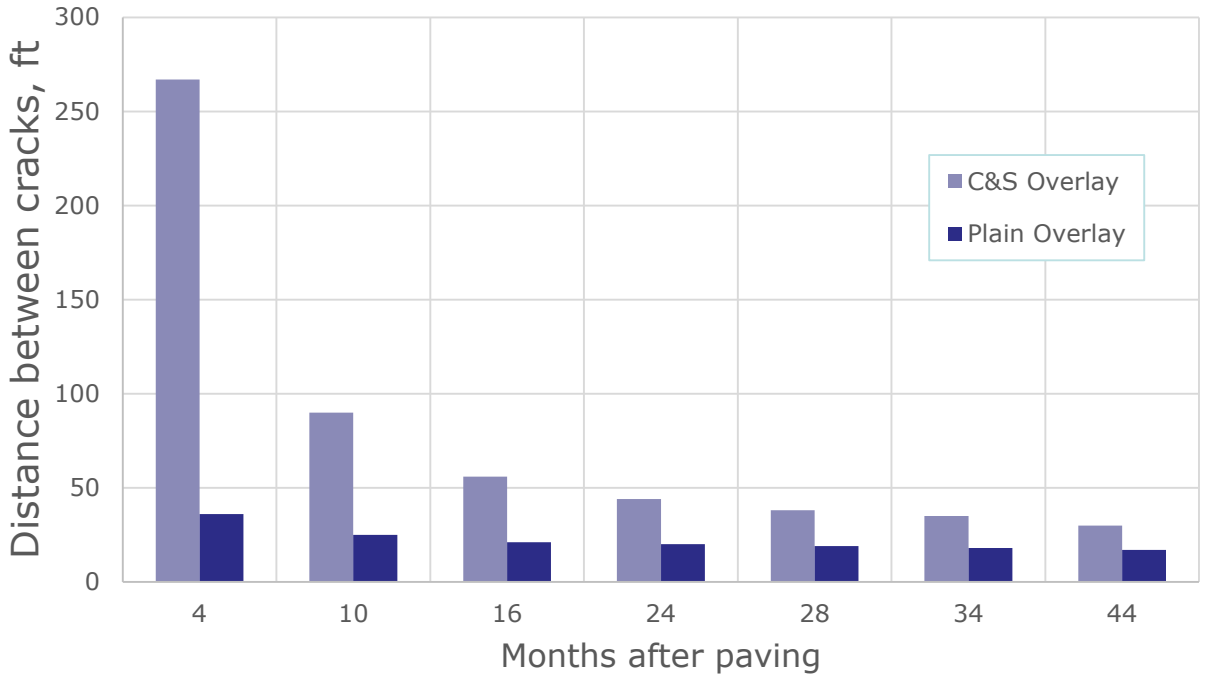
SR28 A55 Pavement Design Solution

- Break and seat on reinforced concrete?
  - Illinois SR 97, reflective cracking survey of 3” bituminous overlay of reinforced concrete pavement



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SR28 A55 Pavement Design Solution

- Initial:
  - **C&S w/16.0” Bituminous Overlay; Cost est. $50,000,000**
- Actual:
  - **C&S w/8.5” Bituminous Overlay; Cost act. $35,000,000**

$15 Million DIFFERENCE
Structural Coefficient
Break & Seat
Subgrade Modulus Correlation

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Crack and Seat with Asphalt Overlay

Greg Tomon, QC Manager

Lindy Paving

LINDY PAVING

PJ DICK • TRUMBULL

C&S with Asphalt Overlay

- Lindy's performed 12 C&S projects since 1999
- The projects variety from :
  - Interstates
  - 3 and 4 digit SR's
  - City busways

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C&S with Asphalt Overlay

7 Major interstates:

- SR 60 Section B16 paved in 1999
- SR 80 Section A04 paved in 2000
- SR 79 Section A12 paved in 2005 & 2006*
- SR 60 Section B27 paved in 2006
- SR 51 Section B31 paved in 2006
- SR 79 Section 35M paved in 2007 & 2008*
- SR 28 Section A55 paved in 2018

*Won the Sheldon G Hayes Award

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C&S with Asphalt Overlay

Other projects:

- SR 4035 Section B01 paved in 2009
- SR 910 Section A20 paved in 2010
- Martin Luther King Busway from downtown Pittsburgh to Wilkinsburg paved in 2010
- SR 366 Section 20R paved in 2015

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C&S with Asphalt Overlay

SR 910 Section A20 – Harmar Township

*Picture taken in 2019

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C&S with Asphalt Overlay

What do all these project have in Common?

Picture of
SR 79 Sec. 35M
taken in 2019,
– 11 years old!!

-NO substructure failures since the original crack and seat operation was performed!

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Benefits of C&S

- Reduction of overall project time and cost
- Enhanced Safety: no open excavation for traveling public and project personnel
- No joint reflection in surface course
- Eliminates saw and seal in overlying pavement with eliminates exposure to silica

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Benefits of C&S (cont'd)

- Virtually Eliminates Undercuts
- Easier to Maintain
- Crack and Seat with SMA surface will increase the Life Cycle expectancy of the pavement in excess of 15 years!
- Reduce the need for crossovers
- A positive perception by traveling public

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Benefits of C&S

Reduction of Overall Project Time and Cost

SR 79 Section A12 – Kirwan Heights

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Benefits of C&S

Reduction of Overall Project Time and Cost

SR 79 Section A12 – Kirwan Heights

- Originally designed as a full depth reconstruction
- Would have had to expose the questionable sub-grade
  - Decreased the need for undercuts
  - Tremendous time savings for the project

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Benefits of C&S

Reduction of Overall Project Time and Cost

SR 28 Section A55 – Tarentum

- Originally bid as weekend closures with full detours
  - Higher than average precipitation that year
  - Decreased the need for undercuts
  - Tremendous time savings for the project
  - A positive perception by traveling public

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C&S Process

- Sawcut at one third points to a depth sufficient to sever mesh reinforcing steel. Provide sawcuts such that the spacing of existing joints and/or sawcuts is approx. 20 feet.
- Typically a Guillotine Breaker is Utilized in the Fracturing Effort as per Test Section Results
  - Typical breaking pattern of 18” to 24” apart
- Seat the Cracked Pavement Using a 50 Ton Pneumatic Roller

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C&S Process (cont'd)

- Establish Overlay Thickness using Acceptable Design Methodology
- Overlay Cracked and Seated Pavement as Per Typ. Sections

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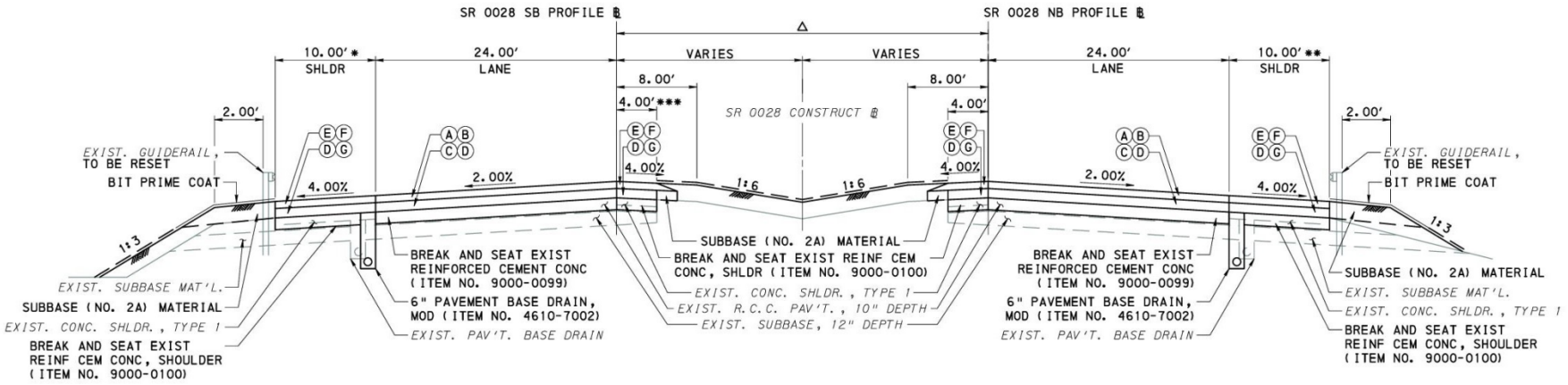
SR 28 Typical Section



TYPICAL BREAK & SEAT SECTION

NOT TO SCALE

SR 0028 NB	STA. 1063+40.00 TO STA. 1078+29.97
SR 0028 SB	STA. 1063+61.50 TO STA. 1078+29.97
SR 0028 NB & SB TIE-IN	STA. 1083+56.64 TO STA. 1134+22.67
SR 0028 NB	STA. 1059+15.00 TO STA. 1063+40.00
SR 0028 SB	STA. 1059+36.50 TO STA. 1063+61.50

* SR 8064 (RAMP H) OFF-RAMP VARIES 50.00′ TO 10.00′
FROM STA. 1070+78.00 TO STA. 1074+61.00 (SEE CROSS SECTIONS)

** SR 8064 (RAMP J) ON-RAMP VARIES 42.00′ TO 10.00′
FROM STA. 1064+40.00 TO STA. 1092+50.00 (SEE CROSS SECTIONS)

*** SR 0028 SB SHLDR RT VARIES 7.00′ TO 4.00′
FROM STA. 1059+36.50 TO STA. 1060+00.00

△ 37.00′ STA. 1056+00.00 TO STA. 1119+00.00
VARIES 37.00′ TO 60.50′ STA. 1119+00.00 TO STA. 1134+00.00
60.50′ STA. 1134+00.00 TO STA. 1316+00.00

LEGEND

Ⓐ LONG LIFE ASPHALT PAVEMENT (LLAP),
SMA MIX DESIGN, WMA WEARING COURSE, RPS,
PG 76-22, 3 TO <10 MILLION ESALS, 9.5MM MIX, 1½" DEPTH, SRL-E
(ITEM NO. 9000-6130)

Ⓑ LONG LIFE ASPHALT PAVEMENT (LLAP),
SUPERPAVE DESIGN, WMA BINDER COURSE, RPS,
PG 76-22, 3 TO <10 MILLION ESALS, 19.0MM MIX, 2½" DEPTH
(ITEM NO. 9000-6140)

Ⓒ LONG LIFE ASPHALT PAVEMENT (LLAP),
SUPERPAVE DESIGN, WMA BASE COURSE,
PG 64-22, 3 TO <10 MILLION ESALS, 25.0MM MIX
(ITEM NO. 9000-6150, MIN. DEPTH 3½")

Ⓓ SUPERPAVE ASPHALT MIXTURE DESIGN, WMA WEARING COURSE (SCRATCH),
PG 64-22, 3 TO <10 MILLION ESALS, 9.5MM MIX, SRL-L

Ⓔ SUPERPAVE ASPHALT MIXTURE DESIGN, WMA WEARING COURSE,
PG 64-22, 3 TO <10 MILLION ESALS, 9.5MM MIX, 1½" DEPTH, SRL-L

Ⓕ SUPERPAVE ASPHALT MIXTURE DESIGN, WMA BINDER COURSE, RPS,
PG 76-22, 3 TO <10 MILLION ESALS, 19.0MM MIX, 2½" DEPTH

Ⓖ SUPERPAVE ASPHALT MIXTURE DESIGN, WMA BASE COURSE,
PG 64-22, 3 TO <10 MILLION ESALS, 25.0MM MIX, 3½" DEPTH

Ⓗ SUBBASE 8" DEPTH (NO. 2A)

Ⓡ PAVED SHOULDERS, TYPE 1-SP

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C&S – S.R. 28

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50 ton cart pulled by a tractor or dozer

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C&S – S.R. 28

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Thank You!

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